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ABSTRACT

A study identified different educational and working paths that workers take, asked which paid off for long-term wage growth and career development, and tested whether educational pathways helped explain more of the variability in wage outcomes. It compared long-term wage growth for two cohorts of young white men: the original cohort that entered the labor force in the late 1960s at the end of the post-World War II economic boom and the recent cohort that entered in the early 1980s after the onset of economic restructuring. Long-term wage growth between the ages 16-36 declined and became significantly more unequal for the recent cohort. The rising demand for education and skill in the new labor market apparently benefitted only those with four-year college degrees. Rising inequality in wage growth was found in all education groups. Working while enrolled and interrupting and returning to school were the dominant pathways to educational attainment. A second set of analyses focused on the recent cohort. Multiple regressions showed educational pathways had a strong effect on long-term wage growth: working while enrolled had a positive impact and interrupted schooling had a negative one. Career choices about industry and occupation mattered. Taking an academic track in high school paid off for workers who get some college credit or enter occupations requiring cognitive skill. Applied and practical fields of study offered the most long-term wage growth to college graduates. (Appendixes contain 19 references and a permanent wage estimation model.) (YLB)

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National Center for Research in Vocational Education

University of California, Berkeley

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Executive Summary

We begin this report by comparing long-term wage growth—a measure of upward mobility—for two cohorts of young white men. These men entered the labor market during very different economic periods, with the original cohort entering in the late 1960s, at the tail of the post-World War II economic boom, and the recent cohort entering in the early 1980s after the onset of economic restructuring.

We find that long-term wage growth between the ages of 16 and 36 has both declined and become significantly more unequal for the recent cohort. The declines have been concentrated among less educated workers (i.e., high school dropouts and high school graduates). Also worrisome are our findings for workers with sub-baccalaureate degrees or only some college experience. While these workers have a clear advantage over high school graduates in terms of wage growth, that advantage has not increased noticeably in recent years. By contrast, young adults with a bachelor's degree or higher have seen increases in their wage growth. The rising demand for education and skill in the new labor market has apparently benefited only those with four-year college degrees. It has not trickled down to improve the wage growth of those with some college experience or associate's degrees.

Education is not the whole story, however, as we find rising inequality in wage growth *within* all education groups. Thus, there has been a dramatic reduction in mobility opportunities for less-educated young men, but even among the well-educated, there are now many more extreme winners and losers. Educational credentials no longer ensure success with the certainty that they once did.

These trends raise a difficult challenge to public policies aimed at improving the living standards and upward mobility of American workers. Simply pushing for more education is not the magic bullet—the increase in inequality has been just as strong within education groups as between them. Moreover, bachelor's degrees are (and will remain) outside the reach of the majority of workers in the foreseeable future. The common response has been to call for greater use of community colleges and sub-baccalaureate college degrees. Yet we have seen no increase in the amount of wage growth that young adults with associate's degrees can expect to experience. Like high school graduates, their wage growth has remained flat over the past three decades (though it is still higher than that of high school graduates). The upshot, then, is that a policy focused on educational credentials alone is likely too simple.

We therefore ask whether there are other aspects of the way that young adults now acquire education that might help us to better explain the rise in inequality and also better inform education and training policy. For

example, we find that young adults in recent years are taking longer to complete their education. Working while enrolled and interrupting and returning to school are now the dominant pathways to educational attainment. Interruptions in particular have become more prevalent among the less educated. On both fronts, we may be witnessing an attempt by young workers to meet the rising demand for education in the labor market (e.g., by taking a job to support oneself during college, by returning to finish a degree after several years in the labor market, or by taking several applied courses to complement a high school degree). The question is whether these emerging pathways have paid off. Descriptive evidence suggests that they have been beneficial for some workers but not for others. In particular, there has been a deterioration in wage growth when interrupting and then returning to school—especially among those with only some college experience or with associate's degrees. It also appears that the new pathways are generating more polar and unequal wage outcomes in recent years, especially those involving interruptions to schooling.

In order to gain further insight into these dynamics, we perform a second set of analyses that focus on the recent cohort only—the young men who entered the labor market in the 1980s and who experienced the negative trends in wages that have garnered so much policy concern. Because data quality is much better for this cohort, we are able to systematically test whether there are characteristics of early career development—beyond simply the amount of education gained—that lead to success or to failure in the new labor market. These characteristics include the distinct educational pathways, high school track, field of study in college, and industry and occupation.

Using multiple regression models, we find that educational pathways do indeed have a strong effect on long-term wage growth: working while enrolled has a positive impact and interrupted schooling has a negative impact. Since both of these pathways have become dominant in recent years, it is clear that decisions about how to pursue education are critical in determining eventual success in the new economy. Career choices about industry and occupation matter as well, in ways one would expect (e.g., unionized sectors offer more wage growth than low-wage service industries). In addition, we find that taking an academic track in high school can pay off for some workers—those who get some college credit but do not attain a degree, and those who enter occupations that require cognitive skill. However, it is applied and practical fields of study that offer the most long-term wage growth to those receiving a degree. While these other features of early career development are clearly of interest, it is important to note that they do not lessen the strong effect of the two educational pathways.

Thus, we have evidence of a complex matrix of decisions about how to enter the labor market, where different combinations of choices lead to very different outcomes. Taken as a whole, these factors explain a significant amount of the inequality in upward mobility, above and beyond simply the amount of education attained. Our findings may therefore serve as a point of intervention for policymakers. For example, the trend toward working while in school has apparently been beneficial to many workers. This would suggest the development of policies that support more flexible education paths and, in particular, the mixing of work and schooling over time. Greater flexibility in choices about field of study and occupational direction may be helpful as well.

It is also clear that there are drawbacks to flexibility because interruptions to school have a strong, negative impact on wage growth; however, especially for youth with few resources, interruptions and returns to school may in fact be the only way to attain better education credentials. Thus, the choice between staying with an employer and acquiring firm-specific skills, or returning to school in order to gain additional skills, has important consequences. Theoretically, the argument for continuous learning in a knowledge-based economy is attractive. The reality, however, is that many young adults who make a considerable effort to upgrade their skills are not faring well. This is clearly an area in which educational policy, perhaps in the form of financial help or innovative enrollment programs, could have a strong impact on worker welfare.

In fact, interrupted schooling is generating greater inequality across all education levels, so that some workers see a high pay-off in terms of upward mobility, while others do not. This suggests that increased movement between school and work in the search for more education may have costs for some groups of workers, causing a type of churning between school and the labor market that has few long-term benefits and that comes at the expense of building up continuous tenure with one employer. The conditions under which an individual's work and educational choices do, and do not, pay off is an important agenda for future research. Whatever the focus, however, such research should give close attention to the experiences of less educated workers. We were less successful in explaining variability in wage outcomes for this group than for better educated workers. Ultimately, however, it is precisely those at the bottom of the labor market that need the most help from public policy.

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Introduction

After a period of stagnant productivity and large trade deficits in the 1980s, the United States economy has bounced back and is showing renewed vitality and global competitiveness. Yet the striking increase in wage inequality that started in the late 1970s has not been reversed, and the wage stagnation that accompanied it has only recently begun to lessen.[1] These trends have raised concern about opportunities for upward mobility in the post-industrial economy. In fact, new research suggests that the earnings that workers make over their career have become more unequal over the past three decades (McMurrer & Sawhill, 1998). In particular, while some youth continue to follow the traditional career path, eventually settling into a stable job that brings regular wage gains over time, others increasingly cycle between a series of low-wage and dead-end jobs, and so fail to experience the income growth that is the backbone of upward mobility (Duncan, Boisjoly, & Smeeding, 1996; Newman & Lennon, 1995).

In an effort to understand the growing inequality in wage outcomes, the role of education has been widely explored. During the 1980s and 1990s, real wages plummeted for workers with few skills and little education. By contrast, workers with college degrees actually saw a mild increase in real wages (Danziger & Gottschalk, 1993; Levy & Murnane, 1992). This has led many policymakers to stress the rising returns to education in the labor market. But the education effects only go so far in explaining the overall growth in inequality, more than half of which has occurred *within* groups of workers of the same education, age, and experience (Katz & Murphy, 1992). To wit, in the new economy, there are college graduates who do not fare well, there are high school graduates who do, and in between lies an entire spectrum of other routes to success and failure that are not captured by simply looking at years of education completed. From the standpoint of education, training, and school-to-work policy, it is important that we understand why.

In this report, we ask whether there are other dimensions to education that might add to our understanding of rising wage inequality. Specifically, we focus on *how* young adults acquire their education, developing a dynamic approach that incorporates the continuity of schooling, the combination of schooling with work, as well as decisions about high school curriculum, fields of study in college, and industry and occupation. We identify workers taking different educational and working paths and ask which of these paths pay off for long-term wage growth and career

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[1] Rising inequality in wage outcomes has been documented for all workers, regardless of race or gender, although it is most pronounced for white men.

development. We then test whether the educational pathways enable us to explain more of the variability in wage outcomes.

The motivation for this approach is simple. Given that not everyone can attain a four-year bachelor's degree, are there educational choices in the new economy that can nevertheless confer some benefit and restore the ability to build a stable career with solid wage growth? Are there others that clearly should be avoided, if possible? For example, we will show that education is taking longer to complete and that significant numbers of young adults are interrupting their schooling, moving back and forth between school and the labor market. The choice between staying with an employer and acquiring firm-specific skills, or returning to school in order to gain additional skills, may have important consequences. If returning to school yields successful outcomes, then this would support the argument for continuous learning in a knowledge-based economy, suggesting policies aimed at fostering flexible education paths. However, such interruptions to entry into the labor market may also indicate a type of churning that has few long-term benefits and that comes at the expense of building up continuous tenure with one employer.

In order to analyze trends in education and work paths and their wage consequences, we compare longitudinal data on early career development for two cohorts of young white men—the first is followed from the late 1960s through the 1970s; the second from the 1980s through the early 1990s. We focus on the total amount of wage growth attained between the ages of 16 and 36. This is a key innovation because it allows us to ask the important question of how and why *upward mobility* has changed (as opposed to simply wages at one point in time). Our analysis consists of two distinct stages. In the first stage, we compare the two cohorts of young workers, describing changes over the past thirty years in wage growth, distinct educational paths, and the effects of those paths on wage growth. The second stage of the analysis then focus on the recent cohort only: the young men who entered the labor market in 1980 and who experienced the negative trends in wages that have garnered so much policy concern. Because data quality is much better for this cohort, we are able to systematically test whether there are characteristics of early career development—beyond simply the amount of education gained—that lead to success or to failure in the new labor market. These characteristics include the distinct educational pathways, high school track, field of study in college, and industry and occupation. Our intuition is that these factors will help us to better explain the observed rise in inequality and also better inform education and training policy.

Data and Measures

Data

We compare two datasets from the National Longitudinal Surveys; both are nationally representative samples of young men who were aged 14 to 22 in the first survey year. The National Longitudinal Survey of Young Men (NLSYM) is a sample of young men born between 1944 and 1952 who were surveyed in 1966 and tracked until 1981, reinterviewed yearly except for 1972, 1974, 1977, and 1979. The National Longitudinal Survey of Youth (NLSY) is a sample of young men born between 1957 and 1965 who were surveyed in 1979 and interviewed yearly through 1994. Throughout, we refer to the former as the "original cohort" and to the latter as the "recent cohort." We selected non-Hispanic whites only because attrition among non-whites was extreme in the original cohort. We also excluded the poor white supplemental sample and the military supplemental sample from the recent cohort, as there are no comparable supplemental samples available for the original cohort. These supplemental samples simply provide additional cases for groups already present, so excluding them has no effect on the representativeness of our sample (e.g. in terms of income).[2] The resulting sample sizes are 2,743 and 2,434, respectively, for the original and recent cohorts.

The power of this research design lies in the fact that we observe both cohorts across a full sixteen years, at exactly the same ages, with comparable information on schooling, work history, and job characteristics. The young men are followed from their late-teens to their mid-thirties. Roughly two-thirds of lifetime job changes and wage growth occur during these years (Murphy & Welch, 1990; Topel & Ward, 1992). Thus, findings from these data will capture most of the economic and career mobility that these young adults can expect to achieve over their lifetime. This research design also enables us to isolate the impact of potential differences in the economic context of early career development: the original cohort entered the labor market in the late 1960s at the tail of the economic boom, while the recent cohort entered the labor market in the early 1980s after the onset of economic restructuring.[3]

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[2] Bernhardt, Morris, Handcock, and Scott (1997, 1998b) conducted a series of analyses and established the representativeness of the samples, as well as the impact of differential attrition bias.

[3] An important characteristic of the original cohort is that about one-third of the respondents served in the Vietnam War at some point during the survey years. A majority of the veterans returned to the survey after their military service, however, and at that point behaved much like the general population along key dimensions such as wages (see Bernhardt et al., 1997).

Measures

Wages are measured as the respondent's hourly wages at his main CPS employer at the date of the interview, which is identified in the same way across both cohorts in all survey years. The wage measure is constructed by the NLS: using direct information if the respondent reported his earnings as an hourly wage, and from questions on the weeks (or months) and hours worked in the last year if the respondent reported in other units. We focus on hourly wages rather than yearly earnings because the latter are confounded by hours and weeks worked and the number of jobs held during the year. The former allows us to more closely approximate the market distribution of wage offers. Analyses are based on the natural log of real wages in 1992 dollars, using the Personal Consumption Expenditure (PCE) deflator.

Instead of wages at one point in time, we focus on *total wage growth* over time as our primary outcome variable because it is the most fundamental measure of upward mobility. Wage growth is defined as the change in the log wage from ages 16 to 36. Since individuals are observed for only sixteen years and at different ages, we standardize to the above twenty-year span using estimates from a random effects model (see the Appendix). These estimates smooth out short-term fluctuations in wages, so they reflect "permanent," long-term wage growth for individuals.

We base the level of education attained on two measures: (1) the number of years of schooling and (2) the highest degree obtained. Thus, an individual with fifteen years of schooling and no reported associate's or bachelor's degree is coded as "some college experience." We identify six categories: (1) high school dropouts, (2) high school graduates, (3) individuals with some college experience (no degree), (4) two-year college graduates (associate's degrees), (5) bachelor's graduates, and (6) those with master's or higher degrees (for simplicity, we refer to these simply as master's graduates). We also identify whether an individual is working while in school. Due to limitations with the NLSYM, we cannot match the timing of employment and enrollment directly, so we use the following indirect approach. We say that an individual has worked during a survey year if he reports more than twenty-six weeks of work in that year. This work may be part-time or full-time, but by spanning more than half of the year we ensure that there will be some overlap with the regular school year. The individual is coded "working while enrolled" if he is working under this definition and enrolled in the same survey year. With this criterion, an individual who only has a summer job and does not work during the school year is coded as "not working" while in school.

Recall that the original cohort was not surveyed in the years of 1972, 1974, 1977, and 1979. For most of our comparative analyses, we remove the corresponding survey years of 1985, 1987, 1990, and 1992 from the recent

cohort in order to avoid a greater probability of observing someone enrolled or working simply because they were interviewed more often in the recent cohort.

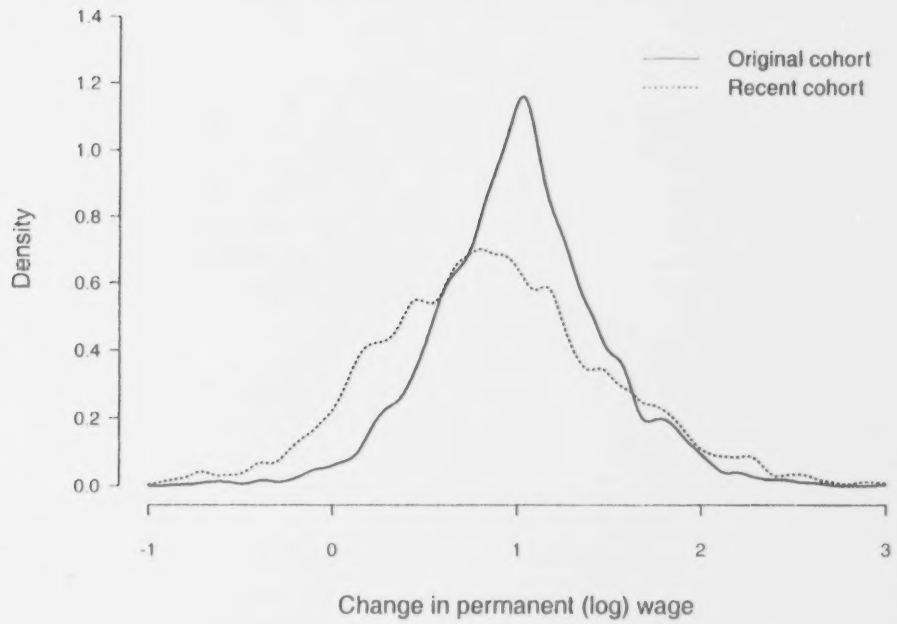
After analyzing the sequences of schooling and work over the sixteen-year period in each survey, three distinct "pathways" emerged. If an individual completes all of his schooling in one continuous spell without working, we label that path "exclusive enrollment." Paths with only one continuous education spell, but during which the individual works at least one year are labeled "working while enrolled." The final category captures those who interrupted their education for at least one year and then returned to school. These individuals may have been working, unemployed, or merely out of the labor force, but in all cases they were not in school, and so we label these "interrupted enrollment" (note that almost everyone in this group combined work with school for some of the years in which they were enrolled). In order to identify educational pathways in an unbiased manner, we restricted our sample to individuals who were observed in school during at least one survey year. This means that workers who have already completed their schooling by the start of the NLS survey are excluded. This reduced our sample sizes to 2,178 and 2,063 for the original and recent cohorts, respectively.

It is important that the reader understand the structure of our data. While each respondent is observed across a number of years, our analyses are performed at the person-level. Our variables are therefore time-invariant summaries of each person's entire history of work and education. Consider the two variables that are the focus of this paper: (1) the educational pathways summarize key information about how young adults made the transition into the labor market, and (2) the wage variable summarizes total wage growth over that same time span. Our goal is to describe how these two dimensions are related to one another, how pathways taken affect upward mobility over the long-run. We recognize, of course, that there is feedback between education and wages over time—goals about desired income affect decisions about how much education to attain, initial experiences with low-wage jobs may lead to a return to school, and mediocre performance in school may lead to an exploration of work alternatives. While clearly an important topic, we do not attempt to disentangle this complex chain of decisions. Rather, our interest lies in the educational and working pathways that result from this chain of decisions and their impact on the total amount of upward mobility gained.

The Rise in Inequality

Figure 1 documents the two trends in upward mobility that motivate this study. Compared to the original cohort, long-term wage growth has both stagnated and become more unequal for the recent cohort. Specifically, total growth from ages 16 to 36 has dropped from a mean of 1.06 in the original cohort to 0.94 in the recent, while its variance has increased from 0.24 to 0.44.[4] This is a near doubling of the variance—that is, inequality—in wage growth. Fewer workers now have wage gains in the middle of the distribution, while more workers have either large or low-wage gains. In fact, there is a significant increase in workers who actually experienced real wage losses over the twenty-year period (values below zero).

Figure 1
Change in Permanent (Log) Wages from Ages 16 to 36

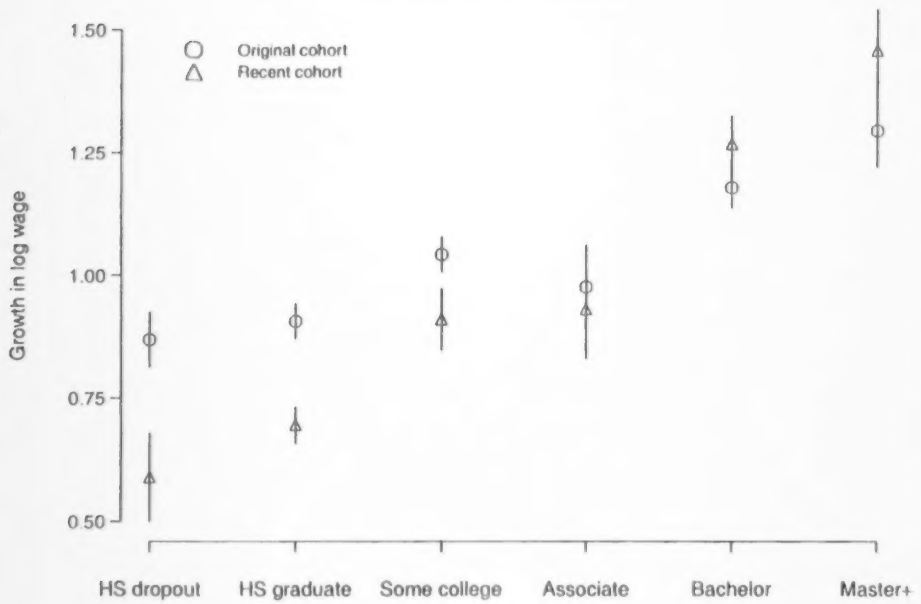


Note: See text for definition of permanent wage

[4] A change in the log wage from ages 16 to 36 of 1.06 indicates that the natural logarithm of the ratio wages is 1.06, so wages at age 36 are *exp* (1.06), or 2.89, times as large as they were at age 16.

These trends in upward mobility mirror those found in cross-sectional wages. It should come as no surprise then that education has played a key role in generating them, as seen in Figure 2. (In this and all subsequent figures, 95% confidence intervals for point estimates are represented by vertical lines, and the original and recent cohort are represented symbolically by a circle and a triangle, respectively.) High school dropouts have seen the strongest decline in mean wage growth in recent years, followed by high school graduates and those with some college experience. For those with associate's degrees, there is no significant cohort difference in wage growth, which is an important point. Apparently, the increased demand for skills and education in the new labor market has not trickled down far enough to affect those holding degrees less than a bachelor's. Conversely, workers who do hold a bachelor's degree or higher have done well, experiencing greater wage growth than in the past.[5] Thus, wage inequality between education groups has grown.

Figure 2
Total Growth in Log Wages from Ages 16-36
Means, by Education Level



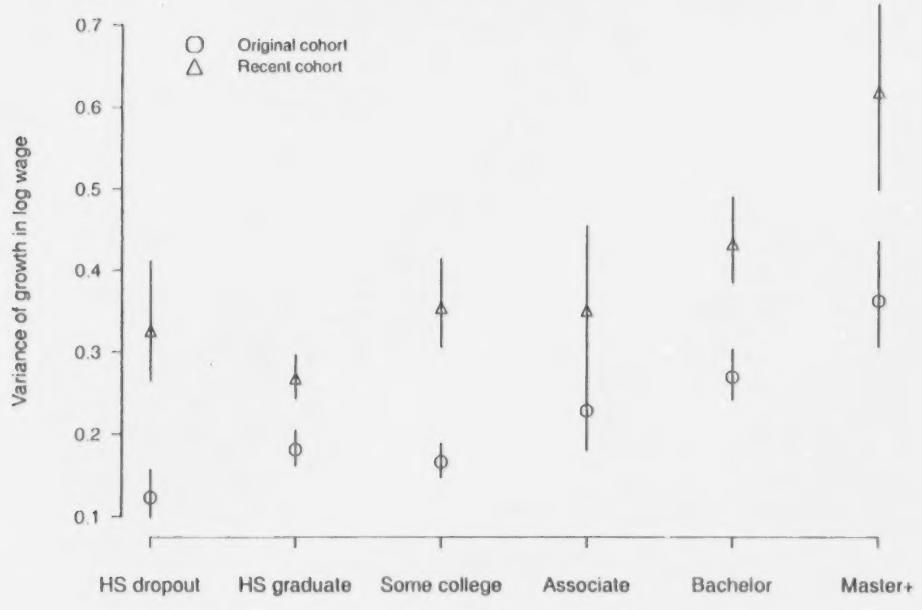
(Vertical lines are 95% confidence intervals)

[5] These differences are not statistically significant, in part due to the larger variability in growth.

We next look within education group and examine the variance (or inequality) of wage growth. Figure 3 shows that the recent rise in inequality holds true for nearly all levels of education group. This means that the growing gap between less- and more-educated young men accounts for only a portion of the overall increased inequality in the recent cohort. So for example, the variance for high school dropouts has nearly tripled, and it has nearly doubled for high school graduates. This increased inequality, when combined with the stagnant wage growth described above, has clearly hurt less educated workers in recent years. Many more are experiencing real wage *losses* over the twenty-year period. In fact, over 14% of recent cohort dropouts experienced wage losses, while less than 1% did so in the original cohort. Recall that wage growth is a measure of mobility, so this means that substantial numbers of workers are now stuck on a path that is effectively going nowhere.

But those with more education have not been immune. While bachelor's and master's graduates have experienced real wage growth in recent years, they have also seen growing inequality. The variance in wage growth for bachelor's graduates increased by 60%, and by 72% for master's graduates.

Figure 3
Total Growth in Log Wages from Ages 16-36
Variances, by Education Level



(Vertical lines are 95% confidence intervals)

Moreover, the absolute magnitude of these variances in the recent cohort is quite large—education has grown in importance, but it is no longer a guarantee of success to the extent that it once was.

Trends in Educational Pathways

We have shown that while education has played a role in the recent deterioration in wage outcomes, there is still considerable variation that remains within each education group. This unexplained residual motivates the sections that follow. Specifically, it may be that the timing of education and how it is combined with work influences wages in different ways (cf. Light, 1995). We may thus be able to explain more of the observed variation in outcomes by better understanding the *context* in which education is obtained.

We begin by looking at how the timing of education has changed. In general, young adults are taking longer to leave school permanently and enter the labor force (Klerman & Karoly, 1994). In our data, we measure this transition by identifying the last time an individual is observed in school, and then using this point to delineate the schooling and postschooling periods in an individual's career.[6] We find striking cohort differences in the timing of education. Young adults in recent years are more likely to be in school at later ages and are therefore taking longer to complete their education. For most of the educational groups, the recent cohort averages about an additional year in school as compared to the original cohort. For example, among youth with some college experience, 50% of the original cohort had not yet completed their education by age 21, while this figure is almost 80% in the recent cohort. Among bachelor's graduates, 50% of the original cohort had not completed their degree by age 24, while 60% had not done so in the recent cohort.

Has this extended enrollment occurred because young men are interrupting their schooling more often, or because they are staying in school longer and working more in the process? In Table 1, we see that the prevalence of exclusive enrollment has dropped for all education levels. These striking shifts away from exclusive enrollment leave many more individuals working while in school. In fact, working while in school is now the dominant pathway for most education groups—between a half

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[6] Since we are trying to track movement in and out of school in this analysis, we must exclude from consideration anyone who was not enrolled in school at least once during the survey. As mentioned in the "Measurement" section, this removes individuals who enter the study having already completed their education, and it does so consistently for both surveys. We also remove Vietnam veterans (708 cases) from this analysis, since their schooling was artificially postponed. Including them does not eliminate, but does reduce, the strength of the differences that we end up observing.

and two-thirds take this route.[7] There has also been a pronounced rise in interrupted schooling among the less educated, however, especially for those who go to college but who do not receive a degree or who stop at an associate's degree. Why interruptions have increased for these youth in recent years is an important question for future research; perhaps continuous schooling is now more difficult to maintain for those with fewer family resources. By contrast, interruptions are far less common among bachelor's graduates. This suggests that we are seeing greater volatility in the educational experiences of the less educated, and a reduction in volatility for the more educated.

Table 1. Pathways to Educational Attainment (Percent of Individuals Reported for Each Category)

		Pathway		
Final Education Attained	Cohort	Exclusive Enrollment	Working While Enrolled	Interrupted Enrollment
High school dropout	Original	54.7	35.6	9.7
	Recent	34.7	45.1	20.2
High school degree	Original	36.0	47.3	16.7
	Recent	17.1	63.3	19.6
Some college, no degree	Original	17.8	41.9	40.3
	Recent	5.1	46.0	48.8
Associate's degree	Original	12.2	25.9	61.9
	Recent	5.1	41.4	53.5
Bachelor's degree	Original	12.4	45.7	41.9
	Recent	6.6	67.6	25.8
Master's or higher degree	Original	10.0	43.0	47.0
	Recent	6.1	61.0	32.9

The important question, then, is how wage growth is affected by working while in school and interrupting enrollment, now that these are the dominant pathways. We will take up this question formally in the next section, but it is worthwhile to take an initial look by way of motivation. In the first half of Table 2, we show mean wage growth by cohort and pathway

[7] We tested whether the recent cohort is working more while in school simply because they remain in school longer. A measure that controls for this difference is the *percent* of time both enrolled and working. We computed this measure and found it larger in the recent cohort for all education groups. Therefore the trend toward increased working while enrolled is true in an absolute and relative sense.

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(for the sake of simplicity, we label continuous enrollment as "clean" transitions). First note that in general, wage growth has deteriorated across the board in the recent cohort, replicating our findings in Figure 1.

However, choices about which education pathway to take apparently have a greater impact in the recent cohort—the differences between the pathways are greater. For example, working while enrolled on average yields 36% higher wage growth than clean transitions, while this increase was only 17% in the original cohort. On one level, this is encouraging, since working while enrolled has become much more common in recent years. So has interrupted schooling, however, and here, the story is less encouraging. Compared to working while in school, interruptions are now more detrimental than they were in the past, yielding a drop of 8% in wage growth in the recent cohort compared to 5% in the original. This is not an insignificant difference for those with working-class incomes, and we should note that it is even stronger among sub-baccalaureate youth—precisely those groups that are interrupting their schooling the most.

Table 2. Mean Wage Growth and Variance by Educational Pathway

Pathway	Original Cohort	Recent Cohort
Mean wage growth		
Clean transition	.95	.73
Working while enrolled	1.11	.99
Interrupted enrollment	1.06	.91
Ratio of working to clean	1.17	1.36
Ratio of interrupted to working	.95	.92
Variance of wage growth		
Clean transition	.23	.42
Working while enrolled	.24	.42
Interrupted enrollment	.24	.45

Thus, the recent shift toward "nontraditional" pathways into the labor market has been beneficial for some workers, but not for others. In particular, there has been a deterioration in wage growth when interrupting and then returning to school, a worrisome trend in an economy where lifelong learning and skill upgrading have become so important.

Finally, the bottom half of Table 2 shows that the new pathways are also generating more polar and unequal wage outcomes in recent years as compared to the past. This should come as no surprise given the overall increase in inequality evident in Figure 1. What stands out, though, is that the increase is strongest for the interrupted schooling pathway. Given a more demanding labor market, incentives or penalties for these interruptions are of primary importance. In the original cohort, interrupted

schooling did not yield noticeably greater inequality than other pathways; however, in the recent cohort, it apparently does. In fact, the rise in variance has been especially pronounced for sub-baccalaureate youth. Such a growing uncertainty of outcomes can be both an incentive and disincentive to continuous learning. Greater variance means that some workers will do especially well when they return to school to gain more education. On the down side, it means that this extra effort does not always pay off. To wit, about 10% of associate's graduates who interrupt their enrollment can expect to experience real wage losses between ages 16 and 36—the figure for those with some college experience is 9%.

Dynamic Models

To this point, we have seen descriptive evidence that the past thirty years have brought strong shifts in the American labor market. Wage growth during the key stage of career development—a measure of upward mobility—has stagnated and become more unequal, with less educated workers faring the worst. Youth are taking longer to complete their education, are working more while in school, and are interrupting their schooling more frequently. This volatility has been especially pronounced among those without a four-year college degree. The new pathways into the labor market apparently also have stronger effects on wage growth: in some cases beneficial; in other cases detrimental. Of particular concern are several negative effects on young adults who for various reasons cannot attain a four-year college degree, but who nevertheless make an effort to return to college for skills upgrading.

In order to confirm and expand these conclusions, we shift to a modeling framework in which we explore the pathway effects dynamically, using multiple regression. In doing so, one of our goals is to explore other factors that might play a role and that might interact with the educational pathways. An obvious question, for example, is the extent to which college field of study might influence some of the patterns described above, especially the increased variability in wage outcomes. Similar questions might be asked about high school curriculum track, and the industries and occupations in which these young workers find jobs and in which the returns to educational decisions are ultimately realized. We will explore the impact of these variables—educational pathway, high school track, field of study, and industry/occupation—in the models discussed in this section.

Because of selection bias, we must consider the effects of the different pathways as descriptive rather than as causative. Individuals may be on a particular pathway for many reasons, ranging from financial constraint to personal preference. Nevertheless, our goal is to describe how the mechanisms leading to wage growth in the labor market have changed. Because educational pathways have changed so dramatically, variation in their impact on wage growth will provide us with a sense of what matters most in the new economy.

Unfortunately, the data for the original cohort do not offer sufficient information on these dimensions. We therefore limit the remainder of our analysis to the recent cohort only. The logic is simple. We have used the cross-cohort descriptive comparison to gain a general sense of what has changed over the past thirty years but now focus on the recent cohort in order to more systematically identify the factors that make for success (or lack of it) in the new labor market of the 1980s and 1990s. Specifically, in the models discussed here we are trying to answer questions of the form, "If a worker's educational pathways and early labor market experience

contain a specific feature, does this positively or negatively influence long-term wage growth?" We do not construct a complete model capturing all of the determinants of wage growth simultaneously, but we will try to isolate some key factors and determine whether they persist in the presence of other controls. A more complex model might explain a larger portion of the variance, but may obscure important substantive effects, since many of the explanatory covariates are bound to be correlated with each other.

Sample and Measures

In addition to previous sample restrictions, we require observations from at least three years in which an individual is working, so that our outcome variable, permanent wage growth from ages 16 to 36, is based on a sufficient number of data points. The net effect of these restrictions is to reduce the sample size of recent cohort respondents from 2,063 to 1,947. While the different age groups are still well-represented in this sample, the distribution of final education differs from that of the sample used in previous sections, with a slightly smaller portion of respondents attaining a high school degree or less. We do not adjust sample weights for this situation; rather, we control for final education in all of our regression analyses.

Recall that our initial analyses were based on a strictly matched sample that excluded four years from the recent cohort to conform to the original cohort's survey years. Since we are now focusing only on the recent cohort, we recomputed our measures to include all available years. We have also expanded our pathway measures, so that we now use (1) the proportion of time an individual was enrolled in school and working and (2) a count of the actual number of interruptions to schooling. We should note that in the first part of the paper, we defined these two pathway measures to be mutually exclusive; here they are not, in order to more flexibly capture the different pathway effects in our models.

We construct the high school curriculum variable by taking the latest reported value. Three categories were identified: (1) vocational/commercial, (2) general, and (3) academic. (The distributions of this and all other variables are given in Table 3.) In practice, general and vocational education students behave similarly in our models, so they were combined in all analyses. The college field of study measure is based on an extensive typology, grouped into more than twenty broad categories such as "biological sciences" or "health professions." For those with some college, we take the most recent value of this variable. For those with degrees, we identified the last field of study observed as that degree was completed.[8]

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[8] We recognize that the interim fields of study contain pertinent information, and we did explore several analyses in which they where included, but we were unable to detect their influence adequately.

Table 3. Characteristics of Sample for Regression Analysis

Characteristics	Recent Cohort
Number of persons	1,947
Age range	16-37
Mean age at last interview	32.2
Mean log wage (deflated using PCE 92)	0.94
Mean work experience at last interview, in years	13.0
Mean years observed working per person	11.2
Mean years observed enrolled in school	5.2
Final education:	
Less than high school	7.7%
High school degree	36.8%
Some college	16.5%
Associate's degree	6.4%
Bachelor's degree	25.2%
Master's degree or more	7.4%
Industry:	
Construction, mining, agriculture	16.4%
Manufacturing, trans. & comm., public admin.	35.9%
Wholesale & retail trade, business serv.	29.5%
FIRE	5.4%
Professional services	12.8%
Occupation:	
Professional, managerial, technical	39.2%
Clerical, sales, private household, service	20.0%
Crafts, operatives, farm, other laborers	40.8%
High school curriculum:	
Vocational/commercial/general	61.3%
Academic	38.7%
Number of interruptions:	
None	64.3%
One	26.8%
Two or more	8.9%
Working while enrolled:	
0-15% of the time	14.2%
15-45%	17.5%
45-70%	20.7%
70-95%	16.4%
Over 95%	31.2%
Proportion majoring in an applied field of study:[1]	
Some college	65.2%
Associate's degree	75.6%
Bachelor's degree	67.1%
Master's degree or more	79.6%

[1]Applied fields of study include architecture, business, communications, computer and information science, engineering, health professions, law, military science, and public affairs

Since our main education variable is the final degree attained, we use the field of study corresponding to that degree in our analyses.

Baseline Model

We begin with a very simple model that regresses permanent wage growth on education, with high school graduates as the reference group. The results, given in the first column of Table 4, confirm the descriptive findings in the first half of the paper (see Figure 2). The premium for college degrees is more than twice that of some college experience and associate's degrees. Not completing a high school degree has a negative effect, but this is not strongly significant. We do not add controls for work experience at this point; such controls will be discussed shortly. This model explains a substantial 18% of the variance in wage growth and will serve as a baseline against which to judge the additional impact of pathway-based covariates.[9]

Educational Pathways

In the second column of Table 4, we add our measures of educational pathways to the model and find that they have a strong impact on long-term wage growth. Interruptions to education are presented as a series of dummy variables, with no interruptions (a single, clean spell) serving as the reference group. First note that the coefficients for final education remain comparable to their baseline values; however, the manner in which that education is attained matters a great deal. A single interruption reduces wage gains significantly by -0.117 units and more than one interruption reduces growth by -0.207 units—this loss is of the same magnitude as the gains from some college and associate's degrees, so high levels of volatility can, in effect, nullify the value of obtaining college experience. We should note that we are probably underestimating the true negative impact of interrupted schooling because we are only capturing its direct effect.[10] There is also an indirect effect. Some of the youth who interrupt their schooling may never go back to school, and thus end up with less education and therefore lower wage growth. Absent data on respondents' educational intentions at different time points, there is empirically no way to isolate this effect. The reader should keep in mind, however, that the negative impact of interruptions is very likely stronger than we estimate here.

Working while enrolled also has a strong impact, but in the opposite direction, yielding positive gains in long-term wage growth. In fact, under

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[9] Small differences in the number of nonmissing observations in the larger models will yield minor differences in the baseline regression coefficients because each analysis includes different explanatory covariates.

[10] We thank Norton Grubb for this point.

Table 4. Permanent Wage Growth, Ages 16-36. Baseline Model with Educational Pathways Effects[1]

	(1)		(2)		(3)	
Variable	$\hat{\beta}$	sig	$\hat{\beta}$	sig	$\hat{\beta}$	sig
Intercept [high school graduate]	.687	***	.605	***	.586	***
	(.023)		(.041)		(.123)	
Less than high school	-.110		-.074		-.056	
	(.057)		(.058)		(.057)	
Some college	.234	***	.261	***	.247	***
	(.041)		(.042)		(.042)	
Associate's degree	.236	***	.269	***	.256	***
	(.059)		(.060)		(.060)	
Bachelor's degree	.590	***	.590	***	.565	***
	(.036)		(.037)		(.038)	
Master's degree or more	.784	***	.791	***	.775	***
	(.054)		(.056)		(.056)	
Educational pathways:						
Interruptions to educational spells [none]						
One interruption			-.117	***	-.124	***
			(.033)		(.032)	
Two or more interruptions			-.207	***	-.217	***
			(.050)		(.050)	
Working while enrolled [0-15% of time]						
15-45% of the time			.084		.087	
			(.051)		(.051)	
45-70% of the time			.115	*	.082	
			(.049)		(.051)	
70-95% of the time			.212	***	.143	**
			(.053)		(.055)	
At least 95% of the time			.160	***	.036	
			(.045)		(.052)	
Real experience (years)					-.016	
					(.021)	
Real experience squared					.002	
					(.001)	
Adjusted R-square	.180		.194		.203	

[1]Significance levels: * = .05, ** = .01, *** = .001; person-based analyses with sample size of 1,947 in baseline model; missingness in more complex models will remove only 1-2% of these individuals.

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Table 5. Permanent Wage Growth, Ages 16-36. Baseline Model with Industry, Occupation, and Educational Pathway Effects[1]

	(1)		(2)	
Variable	$\hat{\beta}$	Sig	$\hat{\beta}$	sig
Intercept [high school graduate]	.727	***	.656	***
	(.032)		(.047)	
Less than high school	-.106		-.074	
	(.056)		(.057)	
Some college	.195	***	.224	***
	(.041)		(.041)	
Associate's degree	.174	**	.208	***
	(.059)		(.060)	
Bachelor's degree	.462	***	.462	***
	(.040)		(.041)	
Master's degree or more	.634	***	.641	***
	(.061)		(.062)	
Industry [manuf., transport., commun.]				
Construction, mining, agriculture	-.037		-.031	
	(.043)		(.043)	
Wholesale and retail trade, business services	-.222	***	-.212	***
	(.037)		(.036)	
FIRE	.245	***	.259	***
	(.065)		(.065)	
Professional services	-.203	***	-.194	***
	(.049)		(.049)	
Public administration	-.014		.005	
	(.063)		(.063)	
Occupation [crafts, operatives]				
Professional, managerial, technical	.244	***	.236	***
	(.039)		(.039)	
Clerical, sales, service	.017		.006	
	(.043)		(.043)	
Interruptions to educational spells [none]				
One interruption			-.126	***
			(.032)	
Two or more interruptions			-.192	***
			(.049)	
Working while enrolled [0-15% of time]				
15-45% of the time			.071	
			(.050)	
45-70% of the time			.109	*
			(.048)	
70-95% of the time			.204	***
			(.052)	
At least 95% of the time			.139	**
			(.044)	
Adjusted R-square	.228		.240	

[1]Significance levels: * = .05, ** = .01, *** = .001; person-based analyses with sample size of 1,947 in baseline model; missingness in more complex models will remove only 1-2% of these individuals.

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this relatively simple model, the benefit to working while in school is sufficient to compensate for the negative effect of interrupting schooling. It is possible that the positive effect of working while in school results from the fact that we haven't yet controlled for work experience—the variable may simply be capturing respondents who have been in the labor market longer. Therefore, in the third column of Table 4, we add years of experience (at the last time the individual is observed) and its square.[11] The effect of experience is not statistically significant in the model, and the coefficients on the education variables remain approximately the same; however, the positive effect of working while in school is in fact reduced. This variable is therefore clearly correlated with experience; unfortunately, we cannot disaggregate the two effects, since most individuals in our sample work at some point while they are in school. The negative impact of interruptions remains untouched—in fact, we will find that this effect persists with several different controls in place. Workers on interrupted pathways face losing many of the gains they were trying to achieve.

Industry and Occupation

We now examine the effect that industry and occupation may have on long-term wage growth. In order to keep the analysis manageable, we have defined the following collapsed groupings. For industries, the categories are (1) construction, mining, agriculture; (2) manufacturing, transportation, and communication; (3) wholesale and retail trade, business services; (4) finance, insurance, and real estate (FIRE); (5) professional services; and (6) public administration. For occupations, the categories are (1) professional, managerial, technical ("white collar"); (2) clerical, sales, private household, service ("pink collar"); and (3) crafts, operatives, farm, other laborers ("blue collar"). We use the *final* industry and occupation observed for our respondents.

The results of adding industry and occupation to the analysis are provided in Table 5 (the reference group for industry is the manufacturing group; for occupation it is the blue collar group). Note first that the coefficients for the education variables change somewhat as these covariates are added. The premia for all types of college experience are dampened, which makes sense since postsecondary education is a credential for

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[11] Testing for the impact of work experience is also advisable for technical reasons. Because individuals are observed at different stages of their career, the permanent wage gains across the standardized span of ages 16 to 36 may be biased downward for those with less experience. These workers are necessarily observed before some of their larger wage gains will occur, and our predictions from the random effects model may not be able to correct for this completely. See the Appendix for further discussion.

entering different occupations and industries. Not surprisingly, wage growth in wholesale and retail trade is lower than in manufacturing and construction, since the latter are traditionally unionized industries. This is a strong effect, -0.222, which is enough to offset the premium for some college and associate's degrees. We also find that the pink-collar occupations, in aggregate, are not significantly different than the blue-collar ones. On the other hand, jobs in white-collar occupations and in FIRE industries yield strong, positive wage growth, as one might expect. With the many combinations of education, industry, and occupation that are possible, we find that nearly 23% of the inequality of wage gains can be explained. Thus, an important characteristic of workers' pathways into the labor market is the destination industry and occupation.

In the second column of the table, we include our two measures of educational pathways. The industry and occupation effects are very similar to those of column one, and the pathway effects are comparable to what was observed in the simpler model of Table 4. In other words, interruptions remain highly detrimental and working while enrolled is generally beneficial to wage growth, even after controlling for education, industry, and occupation effects. We do not display results that include the experience variables, but their inclusion has the same effect as in previous models. We were unable to detect any significant interactions between educational pathways and industry/occupation.

High School Curriculum

High school curriculum turns out to be an important feature of a worker's educational pathway. When contrasting vocational/general track against academic track, we find that the former has a strong negative effect on wage growth, as summarized in the first column of Table 6. In the second column, we interact high school track with each education group. The main education effects are now only for those pursuing an academic track, and the main dummy for vocational/general track refers to high school graduates. We find that the wage growth of high school graduates is largely unaffected by curriculum, but the wage growth of dropouts is affected. While the pattern is not statistically significant, there is mild evidence that vocational curricula offer some value to those who do not complete high school degrees. We witness the opposite pattern for those with some college experience; an academic curriculum has a strong positive payoff for wage growth, while a vocational track does not. Notably, there is no such bifurcation for those with associate's degrees. The value of this degree in the labor market is not mediated by the curriculum taken in high school, so it apparently offers a "fresh start" even to those with vocational education backgrounds. Bachelor's degrees behave similarly—if one completes a four-year degree, then it is not important what one studied in high school. This

Table 6. Permanent Wage Growth, Ages 16-36. Baseline Model with High School Curriculum and Educational Pathway Effects[1]

	(1)		(2)	
Variable	$\hat{\beta}$	Sig	$\hat{\beta}$	sig
Intercept [high school graduate]	.775	***	.731	***
	(.038)		(.062)	
Less than high school	-.111		-.313	
	(.060)		(.241)	
Some college	.210	***	.376	***
	(.042)		(.084)	
Associate's degree	.201	**	.245	*
	(.060)		(.101)	
Bachelor's degree	.538	***	.534	***
	(.041)		(.070)	
Master's degree and more	.715	***	.824	***
	(.060)		(.082)	
Vocational/general high school curriculum	-.100	**	-.049	
	(.034)		(.067)	
Vocational and less than high school			.210	
			(.249)	
Vocational and some college			-.243	*
			(.097)	
Vocational and associate's degree			-.051	
			(.128)	
Vocational and bachelor's degree			.117	
			(.090)	
Vocational and master's degree and more			-.450	**
			(.149)	
Adjusted R-square	.186		.194	

[1]Significance levels: * = .05, ** = .01, *** = .001; person-based analyses with sample size of 1,947 in baseline model; missingness in more complex models will remove only 1-2% of these individuals.

is not the case for master's degrees, which are severely penalized (0.450 units) for those studying vocational curricula in high school. This effect could be driven by selection, in that a vocational student who pursues a master's degree may end up in a program offering lower "value" as a credential.

In Table 7, we explore whether the effect of high school track varies by industry and occupation. In the second column, the main effects again refer

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Table 7. Permanent Wage Growth, Ages 16-36. Baseline Model with Industry, Occupation, and High School Curriculum Effects[1]

	(1)		(2)	
Variable	$\hat{\beta}$	Sig	$\hat{\beta}$	sig
Intercept [high school graduate]	.728	***	.665	***
	(.032)		(.063)	
Less than high school	-.121	*	-.144	*
	(.059)		(.058)	
Some College	.193	***	.182	***
	(.041)		(.041)	
Associate's degree	.172	**	.155	**
	(.059)		(.060)	
Bachelor's degree	.466	***	.399	***
	(.040)		(.044)	
Master's degree and more	.635	***	.544	***
	(.061)		(.065)	
Industry [manuf., transport., commun.]				
Construction, mining, agriculture	-.031		-.154	
	(.044)		(.086)	
Wholesale and retail trade, business service	-.226	***	-.270	***
	(.037)		(.059)	
FIRE	.247	***	.178	*
	(.065)		(.086)	
Professional services	-.206	***	-.258	***
	(.049)		(.066)	
Public administration	-.019		-.074	
	(.063)		(.099)	
Occupation [crafts, operatives]				
Professional, managerial, technical	.247	***	.472	***
	(.039)		(.064)	
Clerical, sales, service	.022		.340	***
	(.043)		(.075)	
Vocational [crafts, operatives, blue collar]			.082	
			(.069)	
Vocational and construction industries			.177	
			(.100)	
Vocational and trades industries			.072	
			(.075)	
Vocational and FIRE industries			.112	
			(.131)	
Vocational and professional services industries			.109	
			(.097)	
Vocational and public administration industries			.104	
			(.127)	
Vocational and professional occupations			-.325	***
			(.077)	
Vocational and clerical occupations			-.467	***
			(.091)	
Adjusted R-square	.231		.248	

[1]Significance levels: * = .05, ** = .01, *** = .001; person-based analyses with sample size of 1,947 in baseline model; missingness in more complex models will remove only 1-2% of these individuals.

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to those who pursued an academic high school curriculum. The interactions are positive for all industries, indicating that it generally pays to pursue a vocational curriculum. However, none of these interactions is statistically significant, so this finding is only suggestive. The interactions are, however, significant for the occupational groups, with both white- and pink-collar workers faring substantially better when they pursue an academic high school track. Again, this makes sense because these occupations are traditionally more reliant on "cognitive skills" than blue-collar occupations. Finally, note that with these controls in the model, the negative effect of dropping out of high school in an academic track has become significant—the converse is that vocational training pays off for dropouts.

College Field of Study

The field of study pursued in college serves to differentiate individuals further as they gain specific skills that may prepare them for an industry or for graduate study. When we look at fields of study in groupings such as science, arts, humanities, and social science, we can detect differences in returns to these different choices. But such categories, when combined with pathways, do not provide much insight because they are too specific. For example, what conclusion should we draw if social science majors who work while in school experience small wage gains? We therefore collapsed the field of study into two substantive categories: (1) applied and (2) theoretical. Architecture, business, communications, computer and information science, engineering, health professions, law, military science, and public affairs share a practitioner orientation, so we categorized them as "applied." Examples of "theoretical" fields include biological sciences, foreign languages, letters, mathematics, physical sciences, and social sciences as these tend to emphasize theory rather than practice. Using these categories, we find that the percent of individuals pursuing applied majors is between 65% and 80%, depending on the level of education. While this is a large proportion, the percent pursuing theoretical majors is of nontrivial size and is substantively different.

We interact the field of study with each of the four postsecondary levels of education and display the results in the first column of Table 8.[12] Fields of study clearly matter a great deal. To wit, applied majors show strong positive effects on the wage growth of respondents with bachelor's degrees and higher. What is surprising is that applied fields do not appear to pay off significantly for workers with associate's degrees or only some college experience—one might expect that practical, usable skills would be even more important in the absence of high educational credentials. We should

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[12] The interactions are only defined for those respondents with college experience, since we are focusing on college field of study.

Table 8. Permanent Wage Growth, Ages 16-36. Baseline Model with College Field of Study and Educational Pathway Effects[1]

	(1)		(2)	
Variable	$\hat{\beta}$	Sig	$\hat{\beta}$	Sig
Intercept [high school graduate]	.687	***	.601	***
	(.023)		(.041)	
Less than high school	-.110		-.074	
	(.057)		(.057)	
Some college	.234	***	.259	***
	(.062)		(.063)	
Associate's degree	.060		.114	
	(.113)		(.113)	
Bachelor's degree	.462	***	.473	***
	(.053)		(.054)	
Master's degree and more	.488	***	.488	***
	(.114)		(.115)	
Applied field of study and some college	.005		.006	
	(.071)		(.071)	
Applied field of study and associate's degree	.225		.192	
	(.127)		(.127)	
Applied field of study and bachelor's degree	.198	***	.178	**
	(.058)		(.058)	
Applied field of study and master's degree and more	.371	**	.376	**
	(.124)		(.124)	
Educational pathways:				
Interruptions to educational spells [none]				
One interruption			-.108	***
			(.033)	
Two or more interruptions			-.204	***
			(.051)	
Working while enrolled [0-15% of time]				
15-45% of the time			.084	
			(.051)	
45-70% of the time			.121	*
			(.050)	
70-95% of the time			.216	***
			(.053)	
At least 95% of the time			.160	***
			(.046)	
Adjusted R-square	.193		.202	

[1]Significance levels: * = .05, ** = .01, *** = .001; person-based analyses with sample size of 1,947 in baseline model; missingness in more complex models will remove only 1-2% of these individuals.

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note, however, that the sample size for associate degree holders is quite small and that Grubb (1997) found a significant wage pay-off for applied field of study for this group.

Finally, we add the educational pathways to the model in the second column of the table. Very little changes, and the effects of the pathways themselves remain unchanged—strongly negative for interruptions to education, and positive for working while in school. This is important, because it means that interruptions remain detrimental in all of the models that we have considered—the negative impact is strong enough to offset other choices that these young workers make (e.g., about how much education to get, which major to study, which industry to enter).

Inequality Revisited

We now return to the original motivation for this research, which is to understand the inequality in wage growth that persists within each education group and that has risen so dramatically over the past several decades. To this end, we have built several models of wage growth and documented the outcomes associated with different pathway features. We can explain 27% of the variation in long-run wage growth by combining into one model the following variables: education, educational pathway, the interaction of high school track with education, industry and occupation, the interaction of high school track with industry and occupation, and the interaction of field of study with education. We call this the full model and compute a set of residuals from the fit. We then compare the residuals from the baseline model (which has only the direct education effects) to the residuals from the full model and summarize their variation by education level in Table 9. The baseline variances are measures of within education group inequality and are comparable to those given in Figure 3. We find that the full model does a good job of explaining inequality for those with some college experience and above. The decrease in residual variation

Table 9. Variance of Residuals, by Final Education Category, Baseline vs. Full Model

Variable	Baseline	Full	Percent Change
Less than high school	.34	.33	3%
High school graduate	.27	.27	0%
Some college	.36	.31	14%
Associate's degree	.36	.32	11%
Bachelor's degree	.44	.36	18%
Master's degree and more	.62	.55	11%
Adjusted R-square for models, and % change	.18	.27	50%

within education group ranges from 11% to 18%. For those with only a high school degree or less, however, decisions about pathways into the labor market have little effect. Even when we ran models for high school dropouts and graduates separately, we found it difficult to explain much of the observed inequality. Nevertheless, overall, the full model explains 50% more of the variance than the baseline model, which is quite substantial.

Summary and Discussion

We began this report by comparing long-term wage growth—a measure of upward mobility—for two cohorts of young white men. These men entered the labor market during very different economic periods, with the original cohort entering in the late 1960s, at the tail of the post-World War II economic boom, and the recent cohort entering in the early 1980s after the onset of economic restructuring.

We found that long-term wage growth between the ages of 16 and 36 has both declined and become significantly more unequal for the recent cohort. The declines have been concentrated among less educated workers—that is, high school dropouts and high school graduates. Also worrisome are our findings for workers with sub-baccalaureate degrees or only some college experience. While these workers have a clear advantage over high school graduates in terms of wage growth, that advantage has not increased noticeably in recent years. By contrast, young adults with a bachelor's degree or higher have seen increases in their wage growth. The rising demand for education and skill in the new labor market has apparently benefited only those with four-year college degrees. It has not trickled down to improve the wage growth of those with some college experience or associate's degrees.

Education is not the whole story, however, because we found rising inequality in wage growth *within* all education groups. Thus, there has been a dramatic reduction in mobility opportunities for less-educated young men, but even among the well-educated, there are now many more extreme winners and losers. Educational credentials no longer ensure success with the certainty that they once did.

These trends raise a difficult challenge to public policies aimed at improving the living standards and upward mobility of American workers. Simply pushing for more education is not the magic bullet—the increase in inequality has been just as strong within education groups as between them. Moreover, bachelor's degrees are (and will remain) outside the reach of the majority of workers in the foreseeable future. The common response has been to call for greater use of community colleges and sub-baccalaureate college degrees. Yet we have seen no increase in the amount of wage growth that young adults with associate's degrees can expect to experience. Like high school graduates, their wage growth has remained flat over the past three decades (though it is still higher than that of high school graduates). Part of this may be due to a perception problem on the part of employers, but it may also have to do with lack of adequate preparation on the part of the students. The upshot, then, is that a policy focused on educational credentials alone is likely too simple.

We therefore asked whether there are other aspects of the way that young adults now acquire education that might help us to better explain the rise in inequality and also better inform education and training policy. For example, we found that young adults in recent years are taking longer to complete their education. Working while enrolled and interrupting and returning to school are now the dominant pathways to educational attainment. Interruptions in particular have become more prevalent among the less educated. On both fronts, we may be witnessing an attempt by young workers to meet the rising demand for education in the labor market—for example, by taking a job to support oneself during college, by returning to finish a degree after several years in the labor market, or by taking several applied courses to complement a high school degree. The question is whether these emerging pathways have paid off. Descriptive evidence suggests that they have been beneficial for some workers but not for others. In particular, there has been a deterioration in wage growth when interrupting and then returning to school—especially among those with only some college experience or with associate's degrees. It also appears that the new pathways are generating more polar and unequal wage outcomes in recent years, especially interruptions to schooling.

In order to gain further insight into these dynamics, we performed a second set of analyses that focused on the recent cohort only—the young men who entered the labor market in the 1980s and who experienced the negative trends in wages that have garnered so much policy concern. Because data quality is much better for this cohort, we were able to systematically test whether there are characteristics of early career development—beyond simply the amount of education gained—that lead to success or to failure in the new labor market. These characteristics include the distinct educational pathways, high school track, field of study in college, and industry and occupation.

Using multiple regression models, we found that educational pathways do indeed have a strong effect on long-term wage growth: working while enrolled has a positive impact and interrupted schooling has a negative impact. Since both of these pathways have become dominant in recent years, it is clear that decisions about how to pursue education are critical in determining eventual success in the new economy. Career choices about industry and occupation matter as well, in ways one would expect (e.g., unionized sectors offer more wage growth than low-wage service industries). In addition, we found that taking an academic track in high school can pay off for some workers—those who get some college credit but do not attain a degree, and those who enter occupations that require cognitive skill. Once in college, however, it is applied and practical fields of study that offer the most long-term wage growth to those receiving a degree. While these other features of early career development are clearly

of interest, it is important to note that they do not lessen the strong effect of the two educational pathways.[13]

Thus, we have evidence of a complex matrix of decisions about how to enter the labor market, where different combinations of choices lead to very different outcomes. Taken as a whole, these factors explain a significant amount of the inequality in upward mobility, above and beyond simply the amount of education attained. Our findings may therefore serve as a point of intervention for policymakers. For example, the trend toward working while in school has apparently been beneficial to many workers. This would suggest the development of policies that support more flexible education paths and, in particular, the mixing of work and schooling over time. Greater flexibility in choices about field of study and occupational direction may be helpful as well.

It is also clear that there are drawbacks to flexibility because interruptions to school have a strong, negative impact on wage growth; however, especially for youth with few resources, interruptions and returns to school may in fact be the only way to attain better education credentials. Thus, the choice between staying with an employer and acquiring firm-specific skills or returning to school in order to gain additional skills has important consequences. Theoretically, the argument for continuous learning in a knowledge-based economy is attractive. The reality, however, is that many young adults who make a considerable effort to upgrade their skills are not faring well. This is clearly an area in which educational policy, perhaps in the form of financial help or innovative enrollment programs, could have a strong impact on worker welfare.

In fact, interrupted schooling is generating greater inequality across all education levels, so that some workers see a high pay-off in terms of upward mobility, while others do not. This suggests that increased movement between school and work in the search for more education may have costs for some groups of workers, causing a type of churning between school and the labor market that has few long-term benefits and that comes at the expense of building up continuous tenure with one employer. Better understanding of under what conditions choices about work and education do and do not pay off is an important agenda for future research (e.g., we have not been able to explore the importance of finding a job that is related to one's field of study). Whatever the focus, however, such research should give close attention to the experiences of less educated workers. Recall that we were less successful in explaining variability in wage outcomes for this group than for better educated workers. Ultimately, however, it is precisely

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[13] This is evidence that the pathway effects are not simply reflecting selection effects (i.e., individuals who choose one pathway differ systematically from those choosing another). We are controlling for a number of variables, including education level and high school track, both of which capture the socioeconomic and skill differences.

those at the bottom of the labor market that need the most help from public policy.

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APPENDIX

Permanent Wage Estimation

We use the following model to smooth an individual's wages of short-term fluctuations: a set of fixed effects to capture the average curve of the wage profile over age, a set of random effects to isolate the heterogeneity in permanent wage gains among individuals, and a residual term to represent the transitory components of wage change within each individual profile (cf. Bernhardt, Morris, Handcock, & Scott, 1998a; Gottshalk & Moffitt, 1994; Haider, 1997; Moffitt & Gottschalk, 1995; Stevens, 1996).

The permanent and transitory components of wage-profile heterogeneity are specified as follows:

$$y_{it} = \mu_{it} + e_{it},$$

where y_{it} is the log of the real wage of individual i in year t. The average wage profile μ_{it} is specified by

$$\mu_{it} = \beta_0 + \beta_1 l_{it} + \beta_2 q_{it},$$

where l_{it} and q_{it} are the linear and quadratic age terms respectively. In this specification, we do not include any additional explanatory covariates such as education and experience because our goal is to smooth the wage trajectory of short-term fluctuations. Such covariates will be included in models to explain the growth in our permanent wage estimates. The coefficients β_0, β_1, and β_2 are average level ("fixed-effect") parameters. We have parameterized l_{it} as the age of individual i in year t centered on age 16 and q_{it} as the quadratic term centered on age 16 and orthogonal to l_{it}. The random effects component is specified as

$$e_{it} = p_{it} + u_{it},$$

where we define p_{it} as the permanent component and u_{it} as the transitory component. Specifically,

$$p_{it} = b_{0i} + b_{1i} l_{it} + b_{2i} q_{it}.$$

Thus, p_{it} is a random quadratic representing the deviation of the individual-specific wage profile from the average wage profile. Under this parameterization, b_{0i}, b_{1i}, and b_{2i} represent the deviations from their fixed-effects counterparts. We model b_{0i}, b_{1i}, and b_{2i} as samples from a mean-zero

trivariate Gaussian distribution. We assume u_{it} is mean-zero and allow the variance of u_{it} to vary by calendar year to capture any business cycle effects.

The individual-specific wage profile is the combination of the average wage profile and the individual-specific deviation: $\mu_{it} + p_{it}$. The parameters in our model are estimated using restricted maximum likelihood (REML) and is asymptotically efficient under the assumption of Gaussianality. The approach provides a best linear unbiased estimator (BLUE) for the individual-specific wage profile; we use these to estimate wage *growth* across a twenty-year span, which we now describe.

Our outcome variable is the growth in log hourly wages from ages 16 to 36. The survey only spans a period of sixteen years, but individuals enter and complete the survey at different ages. For example, some individuals are observed from ages 14 to 30, others from ages 18 to 34, and still others from ages 21 to 37. Using all of these observations, we construct a model that predicts overall wage growth between the ages of 16 to 36. The model assumes that individual wage trajectories are well-described by a quadratic curve—a standard assumption, since this is an empirical feature of wage trajectories that has been extensively documented in labor economics (Murphy & Welch, 1990).

The extrapolations to ages 16 and 36 are based on the BLUE for each individual (cf. Robinson, 1991), but can be understood intuitively as follows: the observed portion of the wage trajectory is matched to a quadratic curve that has the same basic shape after removing short-term variation in wages. That shape over the observed period corresponds to an *individual-specific* shape during the unobserved periods (it is uniquely determined by the three parameters b_{0i}, b_{1i}, and b_{2i}). Our estimates of wage growth across an identical twenty-year age span for each individual are optimal in a statistical sense as BLUEs, and substantively they are constructed by borrowing information from all of the trajectories, so they are correctly based on observed wage growth trends.

Having established that our extrapolation scheme is statistically and substantively sound, we must consider whether the extrapolation is affected by the educational pathways. This could arise if the wage growth measure was based on different numbers of observations, depending on the pathway. Pathways involving more time in the labor market probably have more wage observations, while pathways involving less time in the labor market probably have fewer wage observations. In the latter case, our estimates would have greater uncertainty associated with them, but there is no reason to assume *a priori* that they would be biased.

We computed the average number of wage observations per individual for the three pathways—(1) clean, (2) working, and (3) interrupted—and found that the latter two are nearly identical with a mean of 10.9 and 11.3 observations, respectively. The mean for clean pathways was somewhat lower, at 8.7, which is to be expected since these respondents never work

while in school. This difference is not of great concern for two reasons. First, our extrapolation model ultimately makes an optimal match no matter how many wages are observed, and we should emphasize that having about nine observations per individual is a substantial amount of information.

Second, we performed a goodness-of-fit analysis over the observed portion of the data and did not find a bias due to pathway. Specifically, we compute a mean squared error (MSE) for each individual, summarizing the difference between the predicted curve and the observed wages. We then compared the means of the MSEs by pathway and found no strong differences in this goodness of fit measure. Thus, there is no evidence to suggest that our extrapolation method is better or worse for a particular pathway.